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Two new *Cyclocosmia* (Araneae: Ctenizidae) from Thailand

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Two new *Cyclocosmia* (Araneae: Ctenizidae) from Thailand. - Two new species of the peculiar trapdoor spider genus *Cyclocosmia, C. siamensis* sp. n. and *C. lannaensis* sp. n., are described from male and female specimens collected in Thailand and are compared with *C. ricketti* (Pocock) from China. Notes are given on taxonomic characters, variation, relationships, biology and the distribution of all three species.

Keywords: *Cyclocosmia - C. ricketti - C. siamensis - C. lannaensis* - new species - taxonomy - Thailand - trans-Pacific disjunction - biology.

INTRODUCTION

The species of *Cyclocosmia* are spectacular trapdoor spiders which possess a truncate opisthosoma that ends in a heavily sclerotized round plate or disc similar to a manhole cover. This disc serves as a false bottom with which the spider seals a constriction in the lower portion of its burrow when molested (Gertsch & Platnick, 1975: 1, figs 6-8; Preston-Mafham & Preston-Mafham, 1984: 143, fig. 7.5). Similar though less pronounced modifications of the opisthosoma for burrow plugging are also found in the idiopid genera *Galeosoma* (Africa) and *Idiosoma* (Australia) (Gertsch & Platnick, 1975: 1-2). Phragmotic opisthosomata or abdomina are quite rare (in contrast to phragmotic heads in many ant and termite species) and elsewhere found only in larvae of psilopsocid Psocoptera (Smithers, 1995), in adults of elipsocid Psocoptera (Smithers, 1997) and in adults of wood-boring bostrychid beetles.

The four species of *Cyclocosmia* hitherto known are: *C. truncata* (Hentz, 1841) and *C. torreya* Gertsch & Platnick, 1975 from the USA, *C. loricata* (C. L. Koch, 1842) from Mexico and Guatemala, and *C. ricketti* (Pocock, 1901) from China and allegedly also from Thailand. The latter species was originally described from Fujian Province in eastern China, and later also reported from another unspecified locality in China (Song *et al.* 1999: pl. 1, figs A, B), from northeastern (Gertsch & Platnick, 1975: 19) and from northern Thailand (Huber, 1995a, b; Schwendinger, 1996). The records from Thailand are here attributed to a new species. Although *C. ricketti* was described more than a hundred years ago and the genus appears to be widely distributed in East and Southeast Asia, little is known on the biology of these conspicuous spiders, and males from this region remained unknown.

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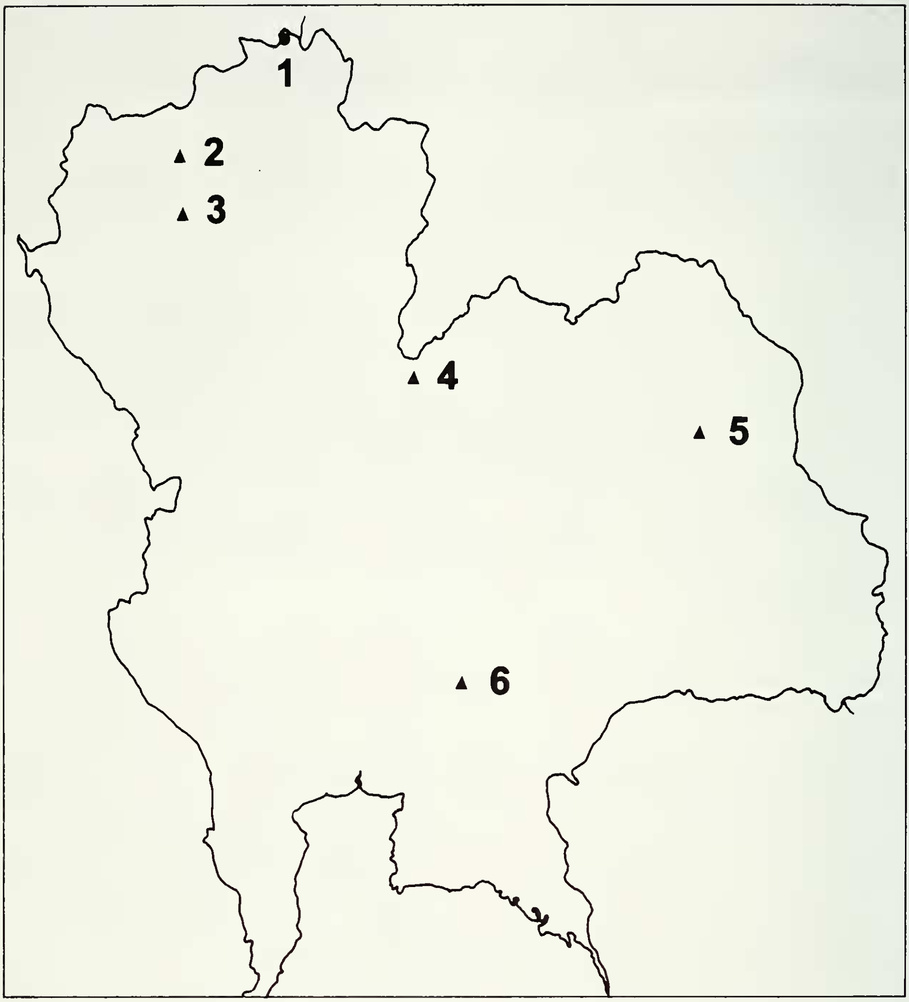


FIG. 1

Records of *Cyclocosmia* in Thailand. *Cyclocosmia lannaensis* sp. n.: 1. Doi Tung. *Cyclocosmia siamensis* sp. n.: 2. Doi Chiang Dao (unconfirmed record), 3. Doi Suthep, 4. Ban Khok, 5. Phu Phan, 6. Khao Yai.

During extensive fieldwork in Thailand I collected *Cyclocosmia* at several localities in northern and northeastern Thailand (Fig. 1), raised juvenile males to maturity and obtained some data on the biology of these spiders. Siegfried Huber made additional specimens from northern Thailand available for study. Examination of this material revealed that two species are present, both of which are new to science and are described below. This adds two most attractive new species to the rapidly increasing number of spider records from Thailand.

MATERIAL AND METHODS

External morphology was studied and drawn with a Zeiss SV11 stereomicroscope, the vulvae with a Nikon Optiphot compound microscope (both with a drawing tube). Vulvae were cleared in KOH or made transparent with warm lactic acid. Opisthosomal discs of exuviae and of specimens were photographed with a ZEISS DSM-940A scanning electron microscope and with the AutoMontage® system using a video camera mounted on a Leica MZ APO stereomicroscope, respectively.

Body measurements were taken with a stereomicroscope and are given in mm. Total body length includes the chelicerae. Lengths of leg and palp articles were measured on their dorsal side, from midpoint of anterior margin to midpoint of posterior margin. The number of corresponding structures on the left and right side of the body, if different from each other, are separated by a stroke. Rib numbers on the opisthosomal discs were counted according to Gertsch & Platnick (1975: 2-3). These refer only to the ribs that end below the disc angles, and only to those of one side in between the pair of paramedian upper ribs that border on the dorsoventral midline (not included in the count) and the last lower rib (included) running transversally across the disc between both lower muscle impressions. The opisthosomal disc diameter refers to the maximal distance between the peripheral margins of ribs on the disc and does not include the rib angles. Measurements of eye diameters and interdistances are based on the dimensions of the whole eye lenses, not just their light-coloured central portions. The curvature of the eye rows refers to an imaginary line running through the centre of each eye in the same row.

Abbreviations. IZCAS - Institute of Zoology, Chinese Academy of Sciences, Beijing, PR Cina; MHNG - Muséum d'histoire naturelle, Geneva, Switzerland; NHML - Natural History Museum of London (formerly British Museum of Natural History), England. AME, ALE, PME, PLE - anterior (posterior) median (lateral) eyes; d - dorsal, pd - prodorsal, pl - prolateral, pv - proventral, rd - retrodorsal, rl - retrolateral, rv - retroventral, v - ventral.

RESULTS

Cyclocosmia ricketti (Pocock, 1901) Figs 2-8, Pl. 1D

Halonoproctus ricketti Pocock, 1901: 209-210, pl. 21, figs 1-1d (description of ♀ holotype).

Cyclocosmia ricketti. - Simon (1903: 885-887, figs 1044-1047). - Berland (1932: 117, fig. 239). - Gerhardt & Kästner (1938: 587, fig. 715). - Gertsch & Platnick (1975: 18-19, figs 28-29, 32, 36; partim). - Song *et al.* (1999: cover, 36, fig. 16h, k-l, pl. 1a-b). - Murphy & Murphy (2000: 62, 485). - Platnick (2004; partim).

MATERIAL EXAMINED

♀ *holotype*: CHINA, N.W. Fokien (= Fujian) Prov., Kuatun, autumn 1896, leg. C. B. Rickett & J. de la Touche (NHML 1898.9.5.1).

CHINA, Sichuan Province, Lushan County, Longmen Town, near Longmen Cave (30.00°N, 102.44°E), 1050 m, 2 ♀, 6.VII.2004, leg. S. Li (IZCAS, n° Xu 033; MHNG).

EXTENDED DIAGNOSIS

Females of *Cyclocosmia ricketti* are distinguished by the following combination of characters: Anterior margin of eye tubercle steeply rising; 4 long bristles in longituninal row running through eye field; lenses of PME as long as or longer than those

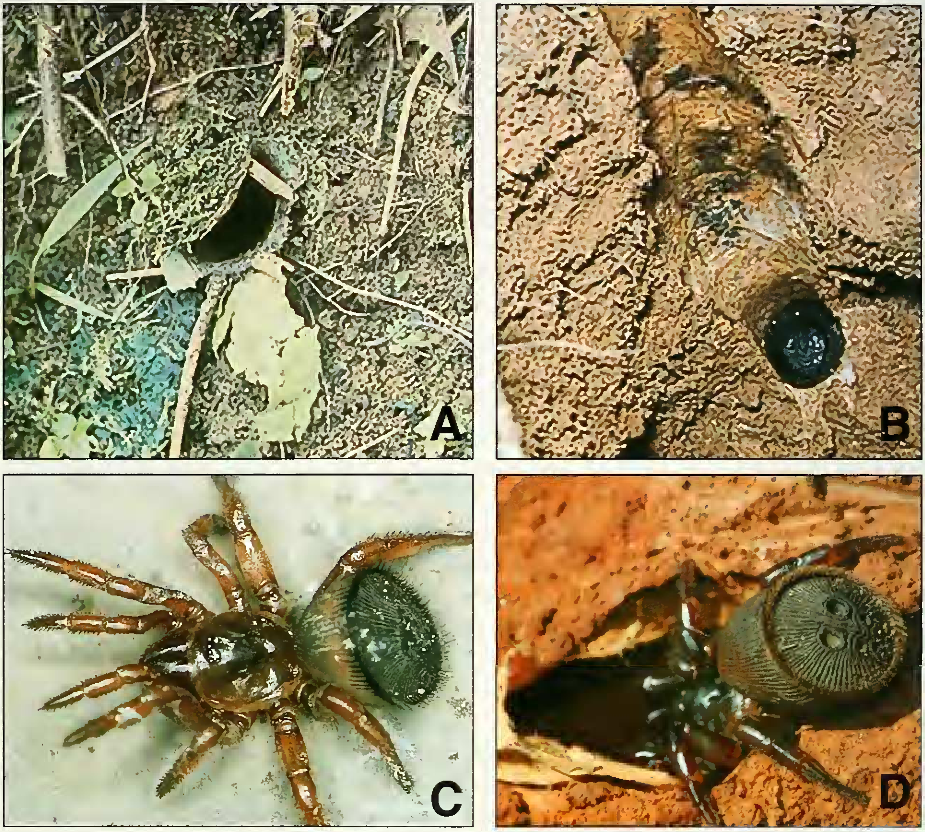
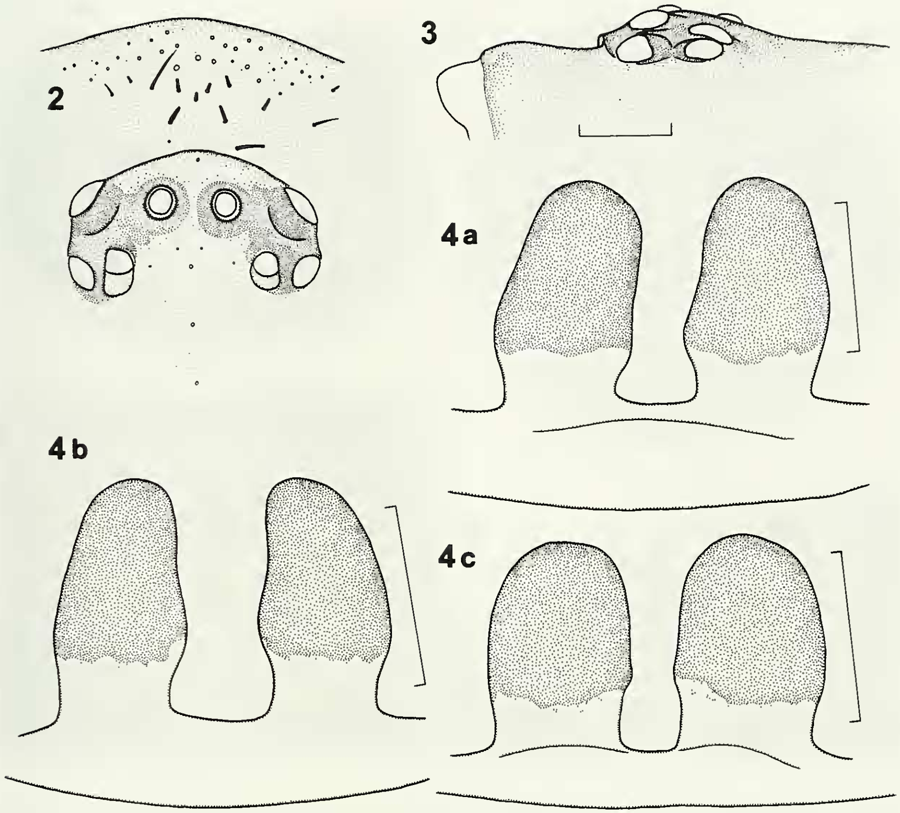


PLATE 1

A. *Cyclocosmia lannaensis* sp. n., burrow entrance with slightly opened trapdoor; note fresh leaf attached to entrance rim. B. Same burrow, upper portion removed, opisthosomal disc of spider in plugging position. C. *Cyclocosmia siamensis* sp. n., ♀. D. *Cyclocosmia ricketti* (Pocock), ♀ from Sichuan (photo by P. Jäger).

of PLE; anterior part of opisthosoma strongly sclerotized (Fig. 6, Pl. 1D); opisthosomal disc with oval upper pair of muscle impressions separated from median pair by only 1 transversal rib, second (lower) transversal rib running into upper portion of ring around median muscle impression (Fig. 5, Pl. 1D); these rings and intermediate transversal ribs thick; ribs of opisthosomal disc covered with small granules, no fine hairs or elevated tubercles present (Fig. 8); setae on rib angles copper-coloured, all strongly bent away from centre of disc (none directed toward centre) and of different sizes, with median setae of each rib angle clearly longer than lateral ones (most distinctly so on lower rib angles) (Fig. 7); crescent-shaped sclerite behind spinnerets separated by distinct suture from unpaired rib angles posterior to it (Fig. 6); spermathecae fairly short and wide, not constricted in median portion (Fig. 4), very similar to those of *C. siamensis* sp. n. (see Figs 17-21).



Figs 2-4

Cyclocosmia ricketti (Pocock). 2. Eye group and clypeus of ♀ holotype, dorsal view. 3. Same, lateral view. 4a. Vulva of holotype, dorsal view. 4b-c. Vulvae of 2 ♀ from Sichuan. Scale lines 1.0 mm.

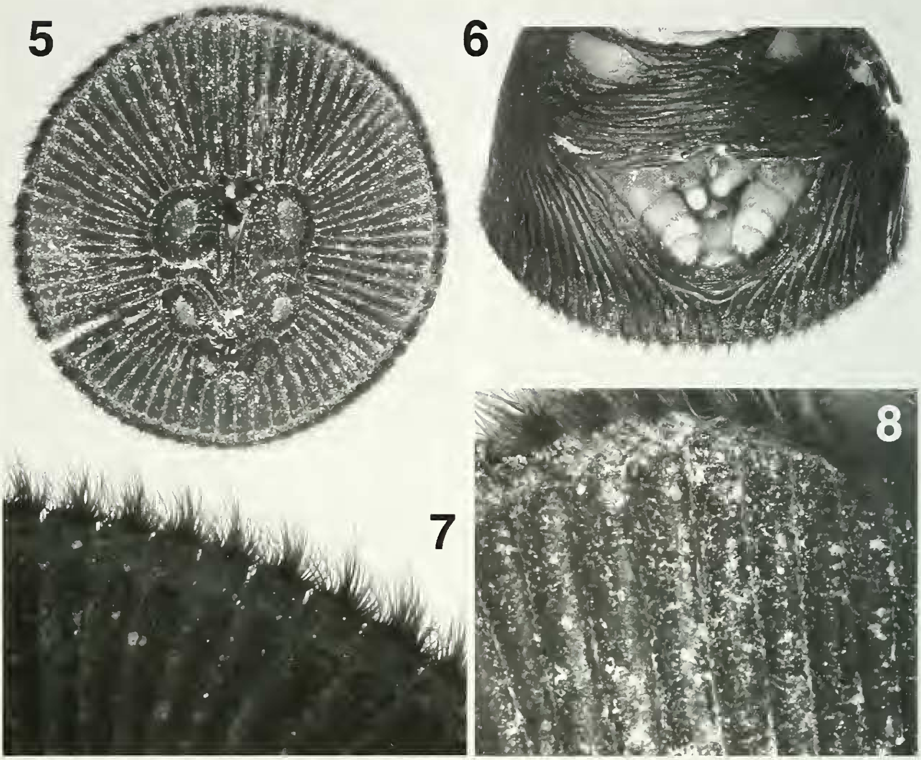
VARIATION

Measurements and rib counts of 3 ♀ (first value refers to holotype). Body length ca. 30, 27.0, 27.3; carapace length 11.7, 10.5, 10.8, width 10.5, 9.4, 9.5; opisthosoma length ca. 15, 13.7, 14.8, width 16.5, 15.3, 15.8; disc diameter 15.8, 13.8, 14.4; rib counts 30/32, 23/24, 24.

Eye tubercle of holotype anteriorly with a distinct ledge (Figs 2, 3); not so in other females examined. Labium with 5 (in holotype), 4, 2, and maxillae with 14-22 cuspules. Palpal patellae with 2/3 proventral spines in holotype, only 1 such spine in both other specimens. Disc ribs of both specimens from Sichuan with less distinctly granular surface than in holotype. Variation of spermathecae, see Fig. 4 and Song *et al.* (1999: fig. 16H).

REMARKS

Most legs and one palp of the holotype are partly or completely detached and were therefore not measured again. The opisthosoma is detached from the prosoma and



Figs 5-8

Cyclocosmia ricketti (Pocock), ♀ holotype. 5. Opisthosomal disc, caudal view. 6. Posterior portion of opisthosoma, ventral view. 7. Setae on disc angles. 8. Detail of opisthosomal disc.

has been pinned through its axis, probably for taking the drawings in the original description.

The female illustrated in Song *et al.* (1999; no locality given; not examined) partly corresponds with the holotype of *C. ricketti* in the shape of its genitalia (Song *et al.* 1999: fig. 16H) and of its opisthosomal disc (Song *et al.* 1999: pl. 1B). However, the drawing of the disc (Song *et al.* 1999: fig. 16L; taken from the same specimen?) shows two transversal ribs separating the upper two pairs of muscle impressions, which is characteristic for both new species described below. This presumably is a mistake by the artist who made this drawing.

Males of this species are still unkown.

RELATIONSHIPS

Cyclocosmia ricketti is most colesly related to *C. siamensis* sp. n. Morphological differences (see paragraph Variation) between the specimens from Fujian and from Sichuan are here regarded as intraspecific variation, but may turn out to be of specific relevance when more material of both sexes becomes available.

BIOLOGY

Both females from Sichuan Province were collected in early July. Their burrows were situated the base of soil banks between fields. As shown on photos taken by S. Li at least one of them had a fairly long thin twig attached to the entrance. Each of these spiders had an egg sac suspended in the lower portion (at about 2/3) of its burrow (P. Jäger, pers. commun.).

DISTRIBUTION

This species appears to have a fairly wide distribution in central and eastern China. The type locality "Kuatun" cannot be identified, but the northwestern part of Fujian Province is about 1500 km away from Longmen Cave in Sichuan Province.

Cyclocosmia siamensis sp. n. Figs 9-30, Pl. 1C

Cyclocosmia ricketti. - Gertsch & Platnick, 1975: 18-19, figs 28-29, 32, 36; description of ♀ under *C. ricketti*). - Huber (1995a: 6-7, photo) - Huber (1995b: 1-6, photo). - Schwendinger (1996: 579).

MATERIAL EXAMINED

♀ *holotype*[*]: THAILAND, Nakhon Ratchasima Province, Pak Chong District, Khao Yai National Park, near Kong Kaeo Waterfall, 680 m, 20.XII.1993, leg. P.J. Schwendinger (MHNG).

Paratypes: From the type locality: 2 ♀ and 1 ♂ (moulted 25.IV., 10.IX.1995, 13.VII. 1996, matured 12.XII.1997), 20.XII.1993; 1 ♂ (moulted 1.V.1995, matured 2.I.1997), 30.IX. 1994. Kalasin Province, Somdet District, Phu Phan National Park, 480 m, 1 ♀, 1 penultimate ♂, 7.XII.1995. All leg. P.J. Schwendinger (MHNG). Chiang Mai Province and District, Doi Suthep-Pui National Park, Doi (= Mount) Suthep, near What (= Temple) Phra That Doi Suthep, ca. 1000 m, 1 ♂ (without palps; date of maturation unknown; coll. S. Huber), 30.XI.1997, 1 ♀, 2.XII.1993 (coll. S. Huber), 1 ♀, 16.XII.2003 (MHNG). All leg. S. Huber. Doi Suthep, Suan Son, 1050 m, 1 penultimate ♂, 18.XI.1997; leg. P.J. Schwendinger (MHNG).

DIAGNOSIS

Similar to *C. ricketti*, females distinguished by the following characters: Anterior portion of opisthosoma less strongly sclerotized (Pl. 1C); upper and median pair of muscle impressions on opisthosomal disc separated by two transversal ribs (Fig. 22); all ribs carrying hairs with dark, short, cylindrical, upright proximal portion and light, long, flat (hollow?), reclining distal portion (Figs 23, 24); 25 or more dark, fairly smooth, slightly curved setae of similar length on each upper rib angle; a few setae with brush-like surface microstructure rising from inner face of rib angles and bent towards disc centre (Figs 25-27); palpal patella usually with only 1 proventral spine; lenses of PME shorter than those of PLE (Fig. 10). Males characterized by: Sclerotization outside opisthosomal disc confined to small plates on disc angles (Figs 29, 30); prolateral side of tibia I with only few distal spines (Fig. 11, see arrow); patellae of anterior legs without retroventral distal spine; legs and palps relatively long, palpal tibia 53-55% of carapace length, 129-131% of bulb length (Fig. 14); left and right part of bulb in ventral view separated by wide straight gap (Figs 15, 16, see arrows). Both sexes with crescent-shaped sclerite posterior to spinnerets and anus not connected to ventral median rib angle (Fig. 13); rib counts ranging from 28 to 34.

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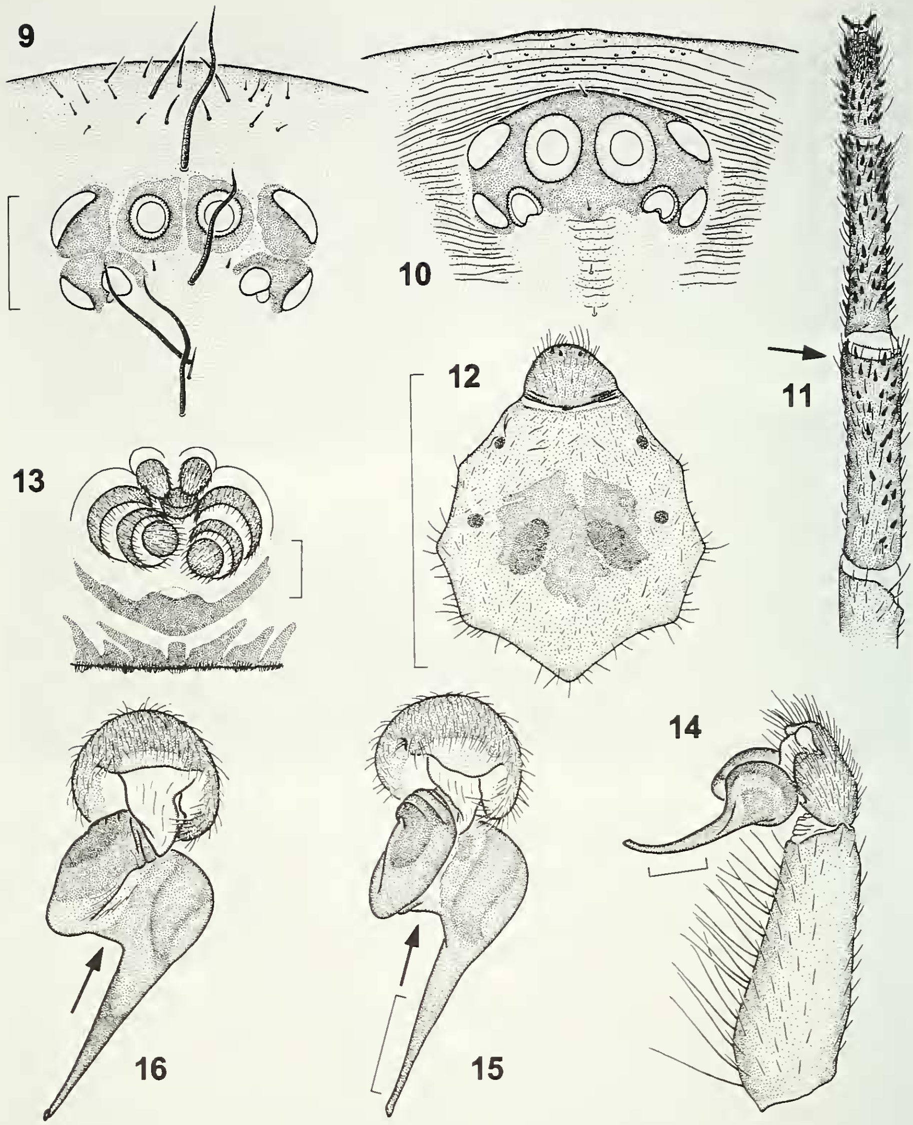
[*] As distinctive characters are more easily recognizable in females and as all primary types of previously described *Cyclocosmia* species belong to this sex, female holotypes are also chosen for both new species.



FIGS 9-16

Cyclocosmia siamensis sp. n. 9. Eye group of ♀ holotype, dorsal view. 10. Eye group of ♂, dorsal view. 11. Leg I of ♂, patella to tarsus, ventral view (arrows pointing to prolateral distal spines of tibia). 12. Sternum and labium of ♂, ventral view. 13. Posterior portion of opisthosoma of ♂, ventral view. 14. Distal part of right ♂ palp, prolateral view. 15, 16. Bulbs of 2 ♂, frontal view; arrows pointing to angular distal invagination between left and right part of bulb. Scale lines 1.0 mm (9, 10, 14-16), 5.0 mm (12, 13), 6.0 mm (11, same scale line as in 12).

DESCRIPTION OF ♀ HOLOTYPE

Coloration in alcohol. Carapace and chelicerae mostly reddish brown, pars cephalica of carapace darker, with three longitudinal bands between eyes and fovea, lateral ones widening anteriorly; ventral side of prosoma lighter, except for chelicerae, maxillae, leg trochanters, labium and sternal sigilla. Opisthosoma light brown, mottled with grey dorsally; spiracles with orange margins; sclerite behind spinnerets reddish brown; opisthosomal disc and rib angles dark brown. All membranes cream.

Length 26.9. Photo of whole animal, see Pl. 1C.

Carapace 8.3 long, 7.4 wide, smooth, without dark reticulation or transverse fissures; few blunt hairs in periphery and on margin, small group of tapering bristles in front of eyes, four long bent bristles in longitudinal row running through eye field, pair of small, short bristles between AME and PME. Eyes on low mound, eye group rectangular, 1.01 long, 2.22 wide anteriorly, 2.12 posteriorly. Anterior eye row straight, posterior row slightly recurved (Fig. 9). Eye diameters and interdistances: AME 0.40, ALE 0.54, PME 0.28, PLE 0.38; AME-AME 0.22, AME-ALE 0.30, PME-PME 0.91, PME-PLE 0.15, ALE-PLE 0.20. MOQ 0.86 long, front width 0.95, back width 1.43. Fovea very deep and strongly procurved, occupying about one forth of carapace width at that point. Tiny pleurits present between carapace and leg coxae.

Chelicerae quite long and robust. Promargin of cheliceral groove with 19/18, retromargin with 13/14 denticles of different sizes and arranged in quite irregular rows. Rastellum carrying 1 retrolateral-proximal and about 12 distal spines.

Maxillae 3.6 long, 2.0 wide, carrying 9/12 distinct black cuspules in prolateral-proximal corner and many weaker reddish spicules distributed all over ventral surface.

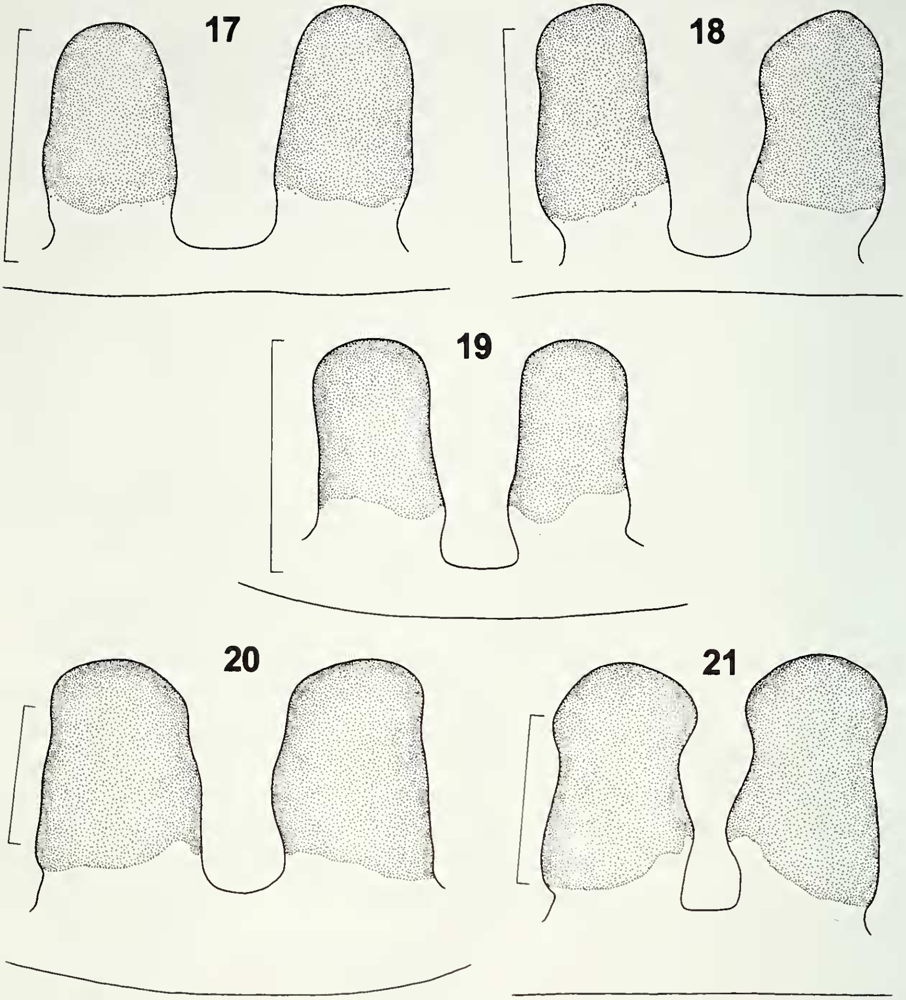
Labium 1.4 long, 1.8 wide, carrying 2 distinct black cuspules.

Sternum 5.4 long, 5.0 wide, separated from labium by shallow furrow. Three pairs of sigilla present. Two anterior pairs small, oval and submarginal, median one more remote from margin than anterior one; posterior pair of sigilla very large, medially confluent, forming shallow orchid-flower-shaped depression enclosing pair of deeper, oval paramedian depressions.

Palp with smooth surface; tarsus and metatarsus depressed. 1 pv distal spine on patella and femur, both femora additionally with 1 stiff pv subdistal bristle, right femur additionally with 1 stiff pd subdistal bristle; many pl to pv and rv to rl spines with slightly bent apices on tibia and tarsus (as also present on legs). Trichobothria: 4 pd and 3 rd in proximal half of tibia, 6/7 d in more (on right side) or less (on left side) regular row on tarsus. Palpal claw with 4/2 proximal teeth on common base.

Legs 3214, fairly short and stout, clothed with black bristles and spines; surface of articles smooth. No scopula on tarsi; no pv terminal spine on patella of anterior legs. Tarsi and metatarsi of anterior legs moderately depressed, those of posterior legs moderately compressed.

Leg spination: I, II: Many pl and rl spines with slightly bent apices on tibiae to tarsi (none on femora and patellae). III, IV: Many pd and distodorsal spines on patellae and tibiae III, IV (no distodorsal ones on retrolateral side of patella IV), d and pd spines on metatarsus III and pd spines on metatarsus IV; 1 rd, 2/3 pd, 1 pv, 1 rv distal spines on metatarsus III; 3/4 v to pv distal spines on metatarsus IV; ca. 20 rv to pd distal spines



Figs 17-21

Cyclocosmia siamensis sp. n. Vulvae of 5 ♀, dorsal view: Holotype (17), ♀ from Khao Yai (18), ♀ from Phu Phan (19), 2 ♀ from Doi Suthep (20, 21). Scale lines 1.0 mm.

on tarsus IIII, 2/3 pv distal spines (difficult to distinguish from nearby stiff bristles) on tarsus IV.

Trichobothria: I: Tibia - 4/5 pd, 4 rd in proximal half; metatarsus - 6/9 d in distal half, irregularly arranged; tarsus - 13/17 pd to rd, irregularly arranged. II: Tibia - 4 pd, 4/5 rd in proximal half; metatarsus - 7/8 d in distal half, irregularly arranged; tarsus - 15/16 pd to rd, irregularly arranged. III: Tibia - 5 pd, 5 rd in proximal half; metatarsus - 5 d in distal half, irregularly arranged; tarsus - 16/18 pd to rd, irregularly arranged. IV: Tibia - 6/7 pd, 6/7 rd in proximal half; metatarsus - 6 d in distal half, irregularly arranged; tarsus - 9/10 d, irregularly arranged.

Paired tarsal claws with 1-2 proximal teeth; unpaired claws bare.

Opisthosoma 12.8 long, 11.9 wide. Disc strongly sclerotized, with 3 pairs of muscle impressions; 2 transversal ribs separating upper and median pair of muscle impressions (Fig. 22); 2 pairs of setae rising from rims of muscle impressions; ribs clothed with fine hairs divided into short, cylindrical, dark upright portion and long, flat, light portion (possibly hollow) bent towards (or lying on) disc surface (Figs 23-25); rib angles distinctly elevated, distally carrying more than 25 long and smooth bristles of more or less similar length and slightly bent away from disc (Figs 25, 26); a few bottlebrush-like bristles rising from posterior surface of rib angles and bent towards disc centre (Figs 25-27). Opisthosoma outside disc sparsely covered with dark needle-like bristles. Two ribs in posterior part of dorsal side of opisthosoma interrupted by indistinct small, longitudinally elliptical, bold spot with leathery surface (remnant of opisthosomal tergite as present in ♂♂ of Atypidae?).

Crescent-shaped sclerite posterior to spinnerets and anus not connected to ventral median rib angle.

Posterior median spinnerets digitiform, 1.3 long; posterior lateral spinnerets 3-segmented, 2.7 long (proximal segment 1.2, median 0.8, distal 0.7).

Vulva (Fig. 17). Spermathecae fairly wide, with almost parallel sides and broadly rounded apices.

DESCRIPTION OF ♂ (MATURED 2.I.1997)

Coloration in alcohol. Prosoma and limbs chestnut-brown, dorsal side and especially carapace darker than ventral side; palpal tibia and tarsus lighter (red-brown when alive) than other articles. Area between anterior carapace margin and fovea uniformly dark brown; in bleached specimen 3 longitudinal dark stripes discernible between eyes and fovea. Opisthosoma mostly light brown, ribs on disc darker along their slightly elevated midline, narrow lines in between ribs and muscle impressions brown, the latter with dark brown margins (Fig. 28); dorsal side of opisthosoma anteriorly with wide grey-brown area reaching middle of rudimentary tergite (Fig. 29); ventral side with orange-brown quadrangular or slightly trapezoidal area (not present in ♀♀) anterior to genital orifice, spiracles with orange-brown margins; crescent-shaped sclerite behind spinnerets brown. All membranes cream.

Length 22.8.

Carapace 7.4 long, 7.1 wide, with dark reticulation over most of its surface and with thin transverse fissures running across area between carapace front margin and fovea (Fig. 10); few short, blunt bristles in front of eyes and in longitudinal row on and behind eye mound, otherwise carapace glabrous; no pair of bristles between AME and PME discernible.

Eyes on low mound, eye group rectangular, 0.96 long, 2.17 wide anteriorly, 2.05 posteriorly. Anterior eye row slightly procurved, posterior row slightly recurved (Fig. 10). Eye diameters and interdistances: AME 0.59, ALE 0.49, PME 0.33, PLE 0.41; AME-AME 0.10, AME-ALE 0.12, PME-PME 0.89, PME-PLE 0.02. MOQ 0.94 long, front width 1.11, back width 1.47. Fovea very deep and strongly procurved, occupying one fifth of carapace width at that point. Tiny pleurites between carapace and leg coxae.

Chelicerae relatively long and slender. Promargin of cheliceral groove with 15, retromargin with 11 denticles of different sizes, arranged in more or less regular rows.

Rastellum slender, composed of 1 retrolateral-proximal spine and 11 distal spines on strongly elevated mound.

Maxillae 3.3 long, 1.8 wide, carrying 1/2 small and several tiny cuspules in prolateral-proximal corner; black needle-like hairs (reddish spicules in ♀♀) distributed over entire surface.

Labium (Fig. 12) 1.1 long, 1.5 wide, carrying 1 small and 3 larger cuspules.

Sternum (Fig. 12) 4.6 long, 4.5 wide, separated from labium by shallow, not clearly outlined groove. Sigilla as in ♀♀.

Palp finely ornamented with small transversal fissures, sparsely clothed with short hairs, most dense hair cover on dorsal side of tarsus, longest hairs on ventral side of tibia. Tarsus short, with invagination separating apical emargination from rounded prolateral-distal lobe. No spines present. Trichobothria: 3 pd and 3 rd in proximal half of tibia, 6 d in oblique row on tarsus. Bulb divided by deep furrow on ventral surface, both halves distally separated by wide, angular invagination (Figs 15, 16, see arrows). Embolus slender and tapering, with compressed and slightly widened apex.

Legs 3214, distinctly longer than in ♀♀, finely ornamented with small transversal fissures (these most pronounced on femora), clothed with short black (blunt or pointed) bristles and black spines. Distal leg segments cylindrical. All tarsi with thin ventral scopula covering slightly less than distal half on leg I and about distal two thirds on other legs, extending over entire width of ventral side of tarsi on all legs except leg IV; longitudinal row of 7/8 spines running through tarsal scopula on leg IV, 9/11 on leg III, 4 on leg II and only 1 spine present inside scopula on leg I.

Leg spination: I: Tibia - 26/29 pv to rv, 4 of them pv, few rv; metatarsus - 57/58 pv to rv; tarsus 22 pl to pv, 2 v, 26 rv. II: Tibia - 31 pv to rv; metatarsus - about 70 pv to rv; tarsus - 28 pl to pv, 8 v, 28 rv to rl. III, IV: Many spines pl to rl on tibiae to tarsi, but none on rl side of metatarsus IV; about 5 (difficult to delimit) dorsodistal spines on metatarsus III.

Trichobothria: I: Tibia - 4 pd, 3/4 rd in proximal half; metatarsus - 4/5 d in distal half; tarsus - 13 d to rd, irregularly arranged. II: Tibia - 4 pd, 4 rd in proximal half; metatarsus - 5/6 d in distal half; tarsus - 13 d to rd, irregularly arranged. III: Tibia - 3/4 pd, 4 rd in proximal half; metatarsus - 4/5 d in distal half; tarsus - 16 d to rd, irregularly arranged. IV: Tibia - 6/7 pd, 6/7 rd in proximal half; metatarsus - 6/7 d in distal half; tarsus - 8 d to rd, irregularly arranged.

Paired tarsal claws with 2 proximal teeth, 1 large principal tooth more distally and 1 small or tiny secondary one more proximally. Unpaired claws bare.

Opisthosoma 10.2 long, 11.0 wide; disc 9.0 in diameter, distinctly less sclerotized than in ♀♀, ribs much narrower, slightly keeled, without hairs (Fig. 28). Rib count 34. Margins of opisthosomal seam indistinct, rib angles little elevated, carrying only about 20 short blunt bristles each. Ribs outside opisthosomal disc weakly developed, lightly pigmented and sclerotized only at rib angles, carrying short black hairs (Figs 29, 30). Rudimentary tergite (?) with leathery surface extending over two ribs in posterior part of dorsal side of opisthosoma (Fig. 29).

Crescent-shaped sclerite between spinnerets (plus anus) and ventral rim of opisthosomal disc moderately sclerotized, not connected to median ventral rib angle (Fig. 13).

Posterior median spinnerets digitiform, 1.0 long; posterior lateral spinnerets 2.9 long (proximal segment 1.3, median 1.0, distal 0.6).

PALP AND LEG MEASUREMENTS OF ♀ AND ♂ (IN PARENTHESES) DESCRIBED ABOVE

	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
Palp	5.0 (6.2)	3.0 (3.2)	2.9 (4.3)	- -	3.6 (2.1)	14.5 (15.8)
Leg I	5.6 (7.5)	3.4 (3.6)	3.1 (5.2)	2.9 (5.7)	1.6 (2.1)	16.6 (24.1)
Leg II	4.5 (6.5)	3.0 (3.2)	2.3 (4.1)	2.3 (5.0)	1.5 (2.0)	13.6 (20.8)
Leg III	4.2 (5.8)	3.1 (3.3)	2.1 (3.7)	2.4 (5.0)	1.6 (2.4)	13.4 (20.2)
Leg IV	4.9 (7.3)	3.7 (3.8)	2.8 (4.9)	3.6 (7.1)	1.9 (3.0)	16.9 (26.1)

DESCRIPTION OF JUVENILES

Third (or later) instar juveniles (body length 4.8, carapace length 1.5, width 1.4; collected from burrow of their mother) possessing fully developed opisthosomal discs with 28-32 ribs but only 1 seta on each rib angle. Penultimate ♂♂ easily recognizable by proximally swollen palpal tarsi.

VARIATION

Measurements and rib counts: ♀♀ (n=6), ♂♂ (n=3) in parentheses. Body length < 42.2 (22.3-24.8), carapace length < 13.0 (7.7-8.6), width < 11.7 (7.0-7.7); rib counts 29-33 (28-34; in the 2 penultimate ♂ 28 and 34).

Spination of patellae: One ♀ from Khao Yai possesses 2 pv subterminal spines on its right palpal patella, 1 additional v spine on the other palpal patella (in other ♀♀ only 1 pv spine present) and 1 pv terminal spine on its right leg patella I (none in other ♀♀). Another ♀ from Khao Yai has 1 v spine on its right leg patella I (none in other ♀♀).

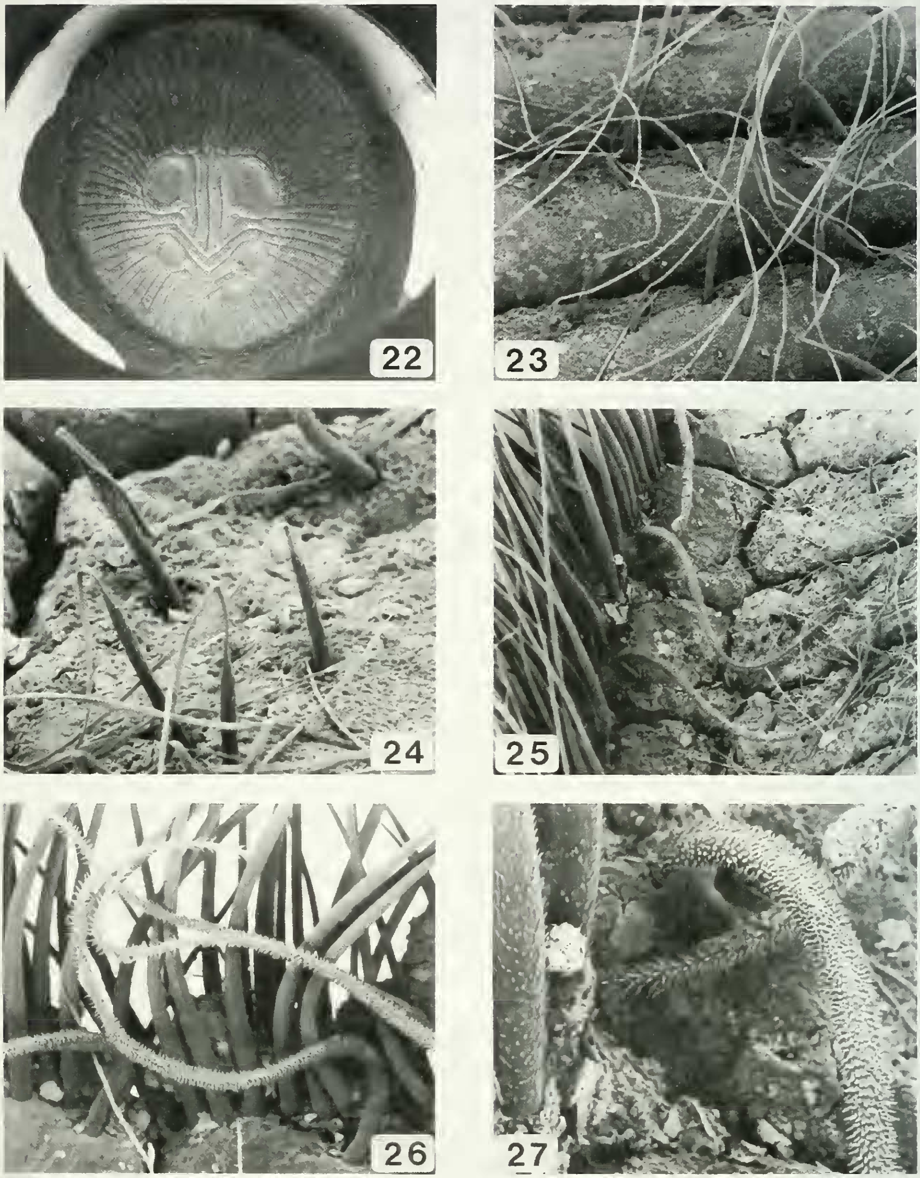
Labium with 2-5 cuspules of different sizes. In the ♀ from Phu Phan the upper pair of muscle impressions on the disc is rather quadrangular. Spermathecae are almost parallel-sided (Figs 17, 19, 20) or slightly constricted after the proximal two-thirds (Figs 18, 21), with evenly rounded (Figs 19, 21) or slightly oblique apices (Figs 17, 18, 20). Variation in ♂ genitalia, see Figs 15, 16.

REMARK

The female specimen from Ban Khok (NE-Thailand) (not examined), described under *C. ricketti* by Gertsch & Platnick (1975: 18-19; figs 28, 29, 32, 36), most likely belongs to *C. siamensis* sp. n. The illustration of its opisthosomal disc shows that two transversal ribs separate the upper and median pairs of muscle impressions and that the ribs carry short setae (Gertsch & Platnick, 1975: fig. 29), which probably correspond to the upright proximal part of the fine hairs present in all females and juveniles of this species examined. These basal parts are easily mistaken for stiff setae when regarded under a stereomicroscope with low magnification. Moreover, Ban Khok [Fig. 1 (4)] lies within the area delimited by other finds of *C. siamensis* sp. n.

RELATIONSHIPS

Cyclocosmia siamensis sp. n. is very similar and obviously closely related to *C. ricketti*.

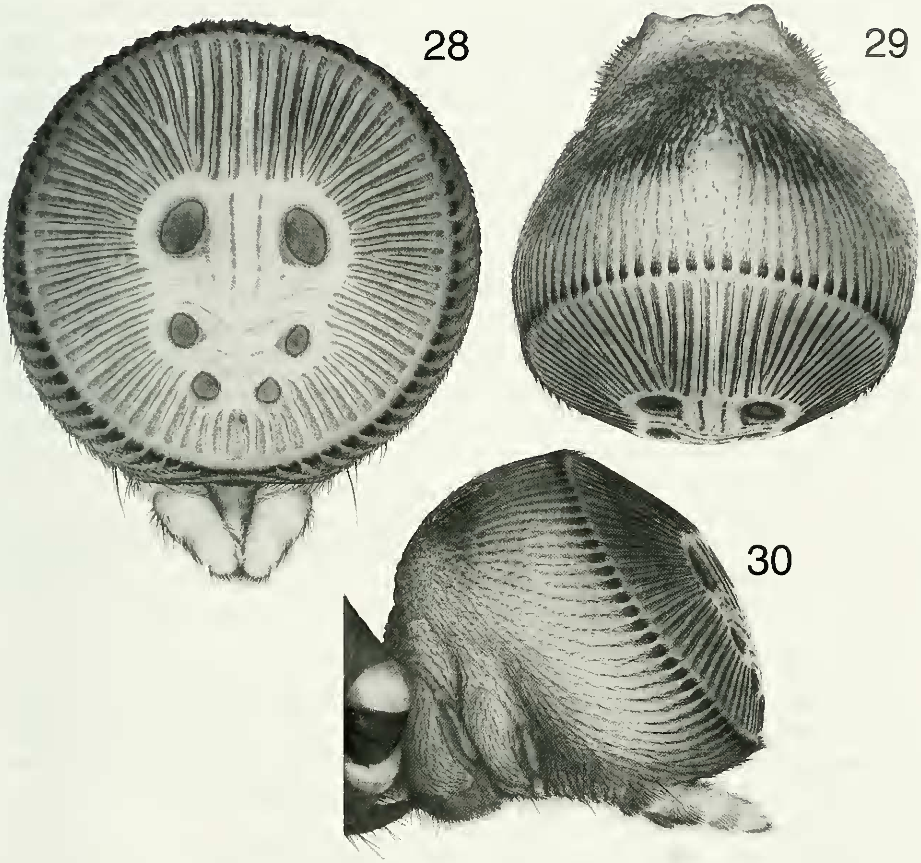


FIGS 22-27

Cyclocosmia siamensis sp. n., ♀ (SEM micrographs). 22. Opisthosomal disc, caudal view. 23, 24. Detail of ribs showing setae. 25. Detail of ribs and rib angles showing three kinds of setae. 26, 27. Detail of inner side of rib angles showing two kinds of setae.

BIOLOGY

Habitat and burrow. The specimens examined were collected from a semi-evergreen rain forest (terminology according to Whitmore, 1991) (in Khao Yai N.P.), from an evergreen hill forest (on Doi Suthep) and from an evergreen gallery forest



FIGS 28-30
Cyclocosmia siamensis sp. n., ♂. 28. Opisthosoma, caudal view. 29. Same, dorsal view. 30. Same, lateral view.

surrounded by seasonally dry deciduous forest (in Phu Phan N.P.). Most specimens were found at vertical road or path cuts, but the two specimens from Phù Phan had settled in a moderately sloping stream bank, and two specimens collected by S. Huber on Doi Suthep were taken in the middle of a level dirt road. It appears that, at least on Doi Suthep, larger specimens prefer to build their burrows into the lower portion of road cuts, whereas smaller specimens were mostly found in the higher portion (pers. commun. by S. Huber and own observations). None of the burrows was found hidden under a cover of leaf litter as described for *C. truncata* (Hunt, 1976).

Cyclocosmia siamensis sp. n. was always found together with other orthognathous spiders, like *Liphistius* spp. and *Atypus* spp., which also require humid conditions.

Borrows are typical for *Cyclocosmia*: Up to 18 cm long; entrance closed with a trapdoor (up to 1.8 cm long and 2.4 cm wide in the case of females, 1.5 cm and 2.1 cm in the case of males) and usually with some dead leaves or twigs attached to the rim (thus enlarging the prey sensing area); burrow walls lined with a dense and tough layer of silk (especially below the entrance, less so at the narrow passages); upper and median portion of burrow wide (allowing the spider to turn round), constricted after about two thirds (where the opisthosomal disc plug is placed) and more or less distinctly widened again near the bottom. A large female with juveniles had a second constriction in the upper portion of the burrow. No prey or exuviae remnants were found inside these burrows. Prior to moulting the female from Phu Phan was weaving the trapdoor to the burrow entrance from inside.

Phenology. In captivity males (from Khao Yai) became mature in early December and at the beginning of January. The date of maturation of the male from Doi Suthep is unknown. It was not yet adult when collected at the end of November (S. Huber, in litt.). A mature female (from Phu Pan) moulted in captivity in early October; two other females (from Doi Suthep) in January and in March (S. Huber, in litt. and Huber, 1995b: 5). Soon after moulting the spiders converted the exuviae into tiny fragments, which were ejected from the burrow in pellets (fragments occasionally stored at the bottom of the burrow in captive specimens).

At Khao Yai more than a hundred juveniles (at least 3rd instar) were found below the shelter of their mother's opisthosomal disc plug at the bottom of her burrow in late December. This indicates that egg development and brooding takes a full year and that females do not reproduce annually.

DISTRIBUTION

Cyclocosmia siamensis sp. n. appears to be widely distributed in northern and northeastern Thailand [Fig. 1 (2-6)]. It presumably also occurs in Laos (maybe also in Myanmar and Cambodia), but due to insufficient sampling in this region and due to the usually rare occurrence of these spiders it is not surprising that they have not yet been found there.

In the course of a biodiversity survey by members of Chiang Mai University in 1995/96 a large *Cyclocosmia* female was collected on Doi Chiang Dao [Fig. 1 (2)]. This specimen probably also belongs to *C. siamensis* sp. n. but unfortunately it could not be traced again later to confirm species identity.

On Doi Suthep this species is locally abundant. In December 2003 S. Huber collected nine specimens from a road side of about 100 m length, and together we subsequently observed two additional occupied burrows at the same site.

Cyclocosmia lannaensis sp. n. Figs 31-55, Pl. 1A, B

MATERIAL EXAMINED

♀ *holotype*: THAILAND, Chiang Rai Province, Mae Sai District, Doi Tung, 1250 m (20°19'28.1"N, 99°49'53.1"E), 16.X.1995, leg. P. J. Schwendinger (MHNG).

Paratypes: From the type locality, 1250-1300 m: 1 ♀, 1.X.1992; 1 ♂ (moulted 8.VII.1993, 22.V.1994, 2.VI.1995, matured XII.1995), 18.XI:1992; 1 ♂ (matured 16.III.1997), 13.X.1994; 3 ♀ and 2 ♂ (one matured 29.X.1995, the other 18.I.2001), 16.X.1995. All leg. P.J. Schwendinger (MHNG).

DIAGNOSIS

Similar to *C. siamensis* sp. n., females distinguished by: All ribs of disc carrying knob-like tubercles but no hairs (Fig. 51); more than 30 dark, slightly bent bristles present on each upper rib angle, most of them standing away from surface (Fig. 50); few setae (all with smooth surface) rising from inner side of rib angles and bending towards disc centre (Fig. 52); spermathecae fairly long and narrow, distinctly constricted medially or after proximal two thirds, their apices rounded (Figs 45-48). Males distinguished from those of *C. siamensis* sp. n. by: Rib sclerotizations outside opisthosomal disc well-developed (Figs 54, 55); patellae of anterior legs with retroventral terminal spine; prolateral side of tibia I with many distal spines (Fig. 36, see arrow); legs and palps relatively shorter, palpal tibia 47-49% of carapace length and 117-126% of bulb length (Figs 36, 38-40); left and right part of each bulb in ventral view separated by rather narrow, rounded invagination (Figs 41-44, see arrow). Both sexes with T- or Y-shaped arrangement of bristles behind AME; crescent-shaped sclerite posterior to spinnerets and anus broadly connected to ventral median rib angle (Fig. 35); upper pair of muscle impressions on disc more parallel-sided (Figs 49, 53); rib counts of opisthosomal discs ranging from 20 to 26.

DESCRIPTION OF ♀ HOLOTYPE

Coloration in alcohol. Sclerotized parts of body mostly brown, opisthosomal disc dark brown, remaining parts of opisthosoma light greyish brown; all membranes cream. Area between eyes and fovea with thin median stripe and with pair of darker, longitudinally elliptical patches posterolaterally on pars cephalica.

Length 32.8.

Carapace 10.5 long, 9.5 wide, smooth, without dark reticulation or transverse fissures; blunt hairs thinly scattered over carapace surface and aligned along carapace margin (there longest), 2 long, tapering sigmoid bristles in front of AME, 5 more (in T-shaped arrangement) behind AME. Eyes on low mound, eye group rectangular, 1.19 long, 2.47 wide anteriorly, 2.30 posteriorly. Anterior eye row slightly procurved; posterior eye row straight (Fig. 32). Eye diameters and interdistances: AME 0.49, ALE 0.74, PME 0.30, PLE 0.37; AME-AME 0.27, AME-ALE 0.35, PME-PME 1.01, PME-PLE 0.15, ALE-PLE 0.27. MOQ 1.07 long, front width 1.04, back width 1.53. Fovea very deep and strongly procurved, occupying about one forth of carapace width at that point. Tiny pleurits present between carapace and leg coxae.

Chelicerae quite long and robust. Promargin of cheliceral groove with 26/27, retromargin with 12/13 denticles of different sizes and arranged in quite irregular rows. Rastellum composed of 1 retrolateral-proximal spine and about 22 distal spines on strongly elevated mound.

Maxillae 4.3 long, 2.5 wide, carrying 18/23 distinct black cuspules in prolateral-proximal corner and many weaker reddish spicules distributed all over ventral surface.

Labium 1.7 long, 2.3 wide, carrying 4 distinct cuspules.

Sternum 6.5 long, 6.1 wide, separated from labium by shallow furrow. Three pairs of sigilla present. Two anterior pairs small, oval and submarginal, median one more remote from margin than anterior one; posterior pair of sigilla very large, medially confluent, forming shallow orchid-flower-shaped depression enclosing pair of deeper, oval paramedian depressions.

Palp with smooth surface; tarsus and metatarsus depressed. 1 pv distal spine on femur and patella, many pl to pv and rv to rl spines with slightly bent apices on tibia and tarsus (as also present on legs). Trichobothria: 4/5 pd and 3 rd in proximal half of tibia, 7/8 d in more or less regular row on tarsus. Palpal claw with 3/2 proximal teeth on common base and 1 small denticle situated more distally.

Legs 3214, fairly short and stout, clothed with black bristles and spines; surface of articles smooth. No scopula on tarsi; no pv terminal spine on patella of anterior legs (as present in ♂♂). Tarsi and metatarsi of anterior legs moderately depressed, those of posterior legs moderately compressed.

Leg spination: I, II: Many pl and rl spines with slightly bent apices on tibiae to tarsi (none on femora and patellae) (Fig. 37). III, IV: Many pd and distodorsal spines on patellae and tibiae III, IV (no distodorsal ones on retrolateral side of patella IV), d and pd spines on metatarsus III and pd ones on metatarsus IV; 1 rd, 3/4 pd, 1 pv, 1 rv distal spine on metatarsus III; 1 pv, 1 v, 1 rv distal spine on metatarsus IV; 8-10 v to pd distal spines on tarsus IIII, 2-4 pv distal spines (difficult to distinguish from nearby stiff bristles) on tarsus IV.

Trichobothria: I: Tibia - 4 pd, 3 rd in proximal half; metatarsus - 7/8 rd to d in distal half, irregularly arranged; tarsus - 13/15 d to rd, irregularly arranged. II: Tibia - 4 pd, 4/5 rd in proximal half; metatarsus - 7/8 rd to d in distal half, irregularly arranged; tarsus - 14/15 d to rd, irregularly arranged. III: Tibia - 4 pd, 5 rd in proximal half; metatarsus - 5/6 rd to d in distal half, irregularly arranged; tarsus - 16/17 d to rd, irregularly arranged. IV: Tibia - 5/6 pd, 5 rd in proximal half; metatarsus - 5/6 rd to d in distal half, irregularly arranged; tarsus - 9 d, irregularly arranged.

Paired tarsal claws with 1-2 proximal teeth on legs I-III, 1-3 teeth on leg IV. Unpaired claws bare.

Opisthosoma 15.2 long, 14.5 wide. Disc strongly sclerotized, with 3 pairs of muscle impressions; ribs carrying knob-like tubercles (Fig. 51); no setae present on disc surface apart from 6 pairs of long bristles (upper pair staggered); 2 transversal ribs (divided into segments) separating upper and median pair of muscle impressions (Fig. 49); rib angles carrying more than 30 long and tapering bristles of similar length (Fig. 50); inner sides of rib angles with few smooth setae bent towards disc centre (Fig. 52). Opisthosoma outside disc sparsely covered with dark, needle-like bristles. Two ribs in posterior part of dorsal side of opisthosoma interrupted by indistinct rudimentary tergite (?) with leathery surface.

Crescent-shaped sclerite posterior to spinnerets (plus anus) connected to ventral median rib angle by a fairly wide stalk.

Posterior median spinnerets digitiform, 1.5 long; posterior lateral spinnerets 3.9 long (proximal segment 1.8, median 1.3, distal 0.8).

Vulva (Fig. 45). Spermathecae fairly long and narrow, distinctly constricted after proximal two thirds, its apices broadly rounded.

DESCRIPTION OF ♂ (MATURED 16.III.1997)

Coloration in alcohol. Three dark longitudinal bands (becoming narrower posteriorly) between eye group and fovea; no pair of dark posterolateral patches on pars cephalica. Prosoma and limbs chestnut-brown, dorsal side and especially carapace darker than ventral side; palpal tibia and tarsus lighter (red-brown when alive) than other articles. Opisthosoma mostly light brown, with chestnut-brown ribs and muscle impressions on disc; trapezoidal area anterior to genital orifice orange-brown.

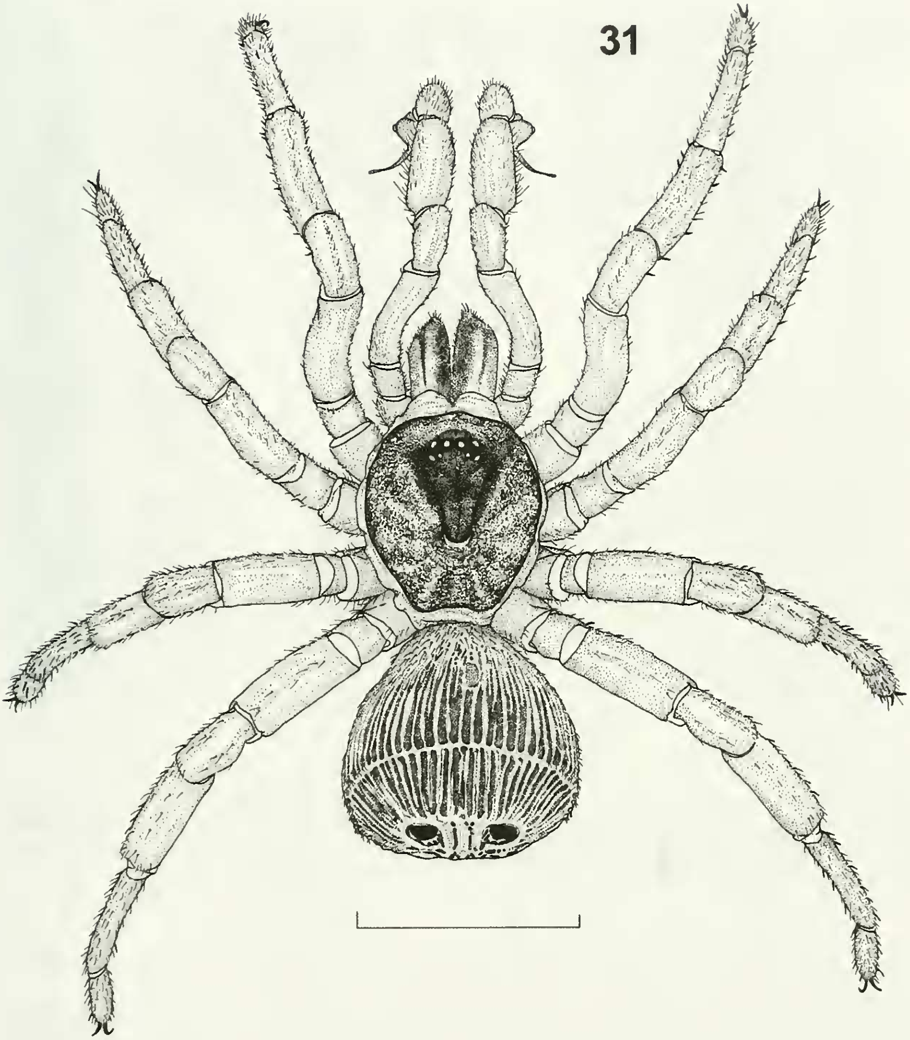
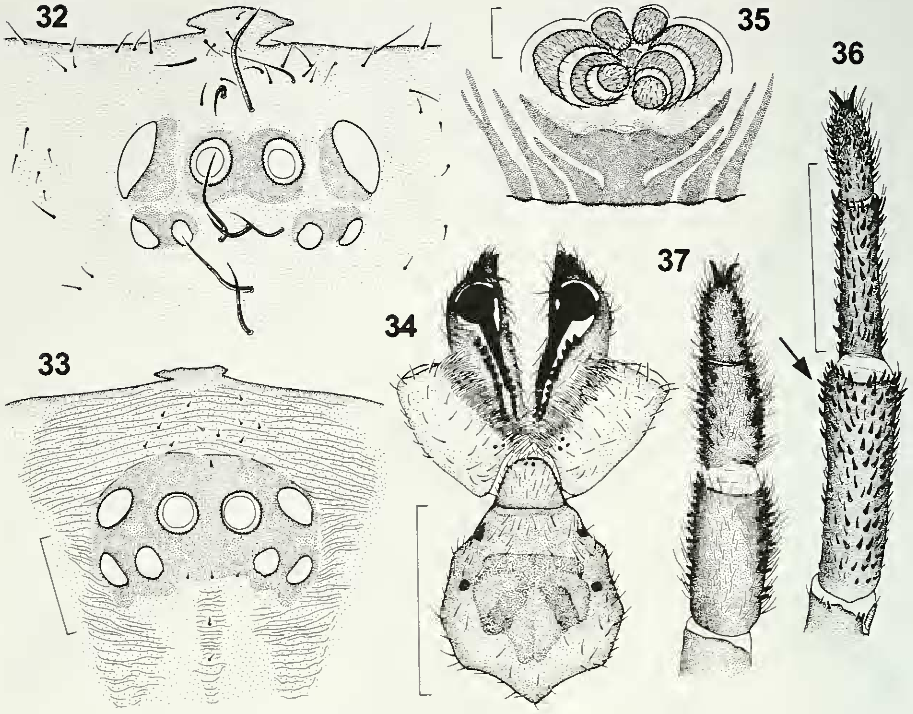


FIG. 31
Cyclocosmia lannanensis sp. n., habitus of ♂. Scale line 10.0 mm.

Length 24.8. Illustration of whole animal, see Fig. 31.

Carapace 7.6 long, 6.8 wide, with dark reticulation on most of its surface and with thin transverse fissures running across area between carapace front margin and fovea; few very short, blunt bristles in front of and behind eye mound (posterior ones in T-shaped arrangement), otherwise carapace glabrous (Fig. 33). Eye group 0.94 long, 2.05 wide anteriorly and posteriorly. Anterior eye row slightly procurved, posterior row slightly recurved (Fig. 33). Eye diameters and interdistances: AME 0.42, ALE 0.44, PME 0.35, PLE 0.36; AME-AME 0.21, AME-ALE 0.15, PME-PME 0.86, PME-PLE



FIGS 32-37

Cyclocosmia lannaensis sp. n. 32. Eye group of ♀ holotype, dorsal view. 33. Eye group of ♂, dorsal view. 34. Chelicerae, maxillae, labium and sternum of ♂, ventral view. 35. Posterior portion of opisthosoma of ♂, ventral view. 36. Leg I of ♂, patella to tarsus, ventral view. 37. Same of ♀. Scale lines 1.0 mm (32, 33, 35), 5.0 mm (34, 36, 37).

0.12. MOQ 0.84 long, front width 1.09, back width 1.38. Fovea occupying one fifth of carapace width at that point. Tiny pleurites between carapace and leg coxae.

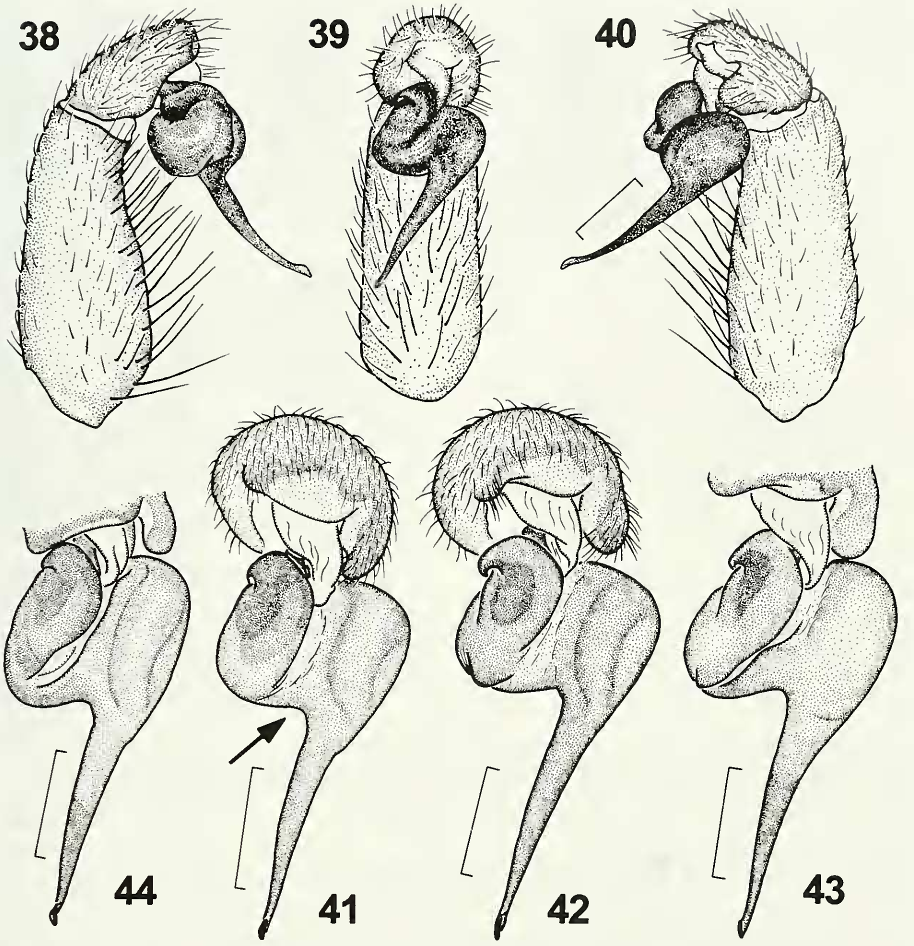
Chelicerae (Fig. 34) slightly weaker than in ♀♀. Promargin of cheliceral groove with 13/15, retromargin with 13/10 denticles of different sizes and arranged in more or less regular rows. Rastellum composed of 1 retrolateral-proximal spine and 5 distal spines.

Maxillae (Fig. 34) 3.2 long, 1.8 wide, carrying 1/0 distinct, 2/3 small and several tiny cuspules in prolateral-proximal corner; black needle-like hairs (reddish spicules in ♀♀) distributed over entire surface.

Labium (Fig. 34) 1.2 long, 1.5 wide, carrying 1 small and 1 tiny cuspule.

Sternum (Fig. 34) 4.5 long, 4.4 wide. Sigilla as in ♀.

Palp (Figs 38-41) finely ornamented with small transversal fissures, sparsely clothed with short hairs, most dense hair cover on dorsal side of tarsus, longest hairs on ventral side of tibia. No spines present. Trichobothria: 4 pd and 3 rd in proximal half of tibia, 6 d in more or less regular row on tarsus. Tarsus short, with invagination

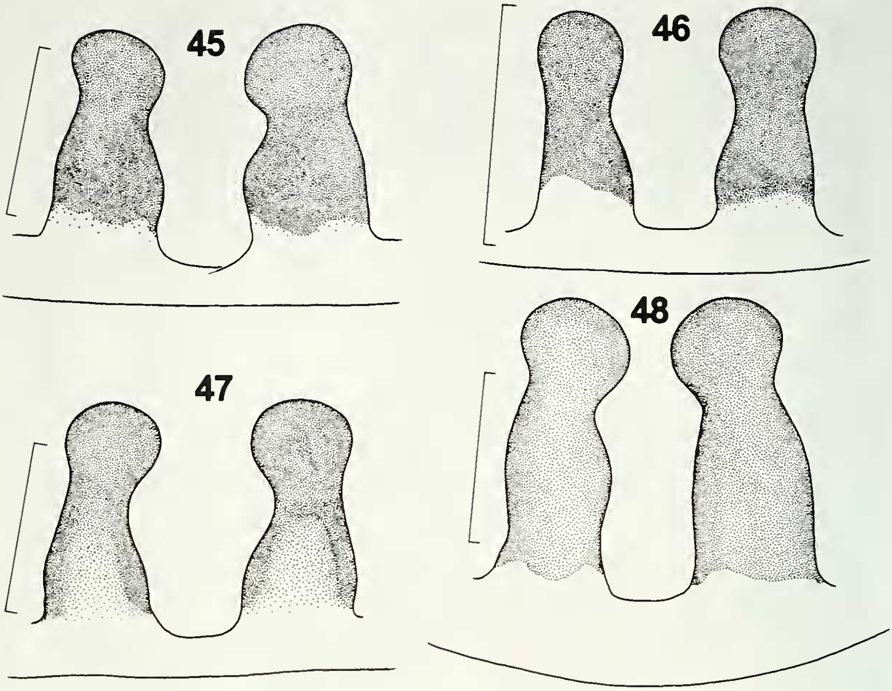


Figs 38-44

Cyclocosmia lannaensis sp. n., ♂. 38. Distal part of right palp, retrolateral view. 39. Same, ventral view. 40. Same, prolateral view. 41-44. Bulbs of 4 ♂, frontal view; arrow pointing to rounded invagination between left and right part of bulb. Scale lines 1.0 mm.

separating apical emargination from rounded prolateral-distal lobe. Bulb divided by deep furrow on ventral surface, both halves distally separated by shallow, rounded invagination (Fig. 41, see arrow). Embolus slender and tapering, with compressed and slightly widened apex.

Legs 3214, much longer than in ♀♀, with distinctly fewer and shorter (blunt or pointed) bristles and different arrangement of spines; surface of articles finely ornamented with small transversal fissures (most pronounced on femora). Distal leg segments cylindrical. All tarsi with thin ventral scopula covering distal half of tarsus I and distal two thirds of other tarsi; scopula confined to narrow (less than tarsal width) longitudinal band on tarsus IV; longitudinal row of 6-8 spines running through tarsal



Figs 45-48

Cyclocosmia lannaensis sp. n., vulvae of 4 ♀: Holotype (45). Scale lines 1.0 mm.

scopula on posterior legs, only 1-2 spines present inside scopula on anterior legs (Fig. 36).

Leg spination: I: Patella - 1 rv; tibia - about 55 pv to rv (14 pv, few rv); metatarsus - about 35 pv to rv; tarsus 14 p to pv, 2 v, 16 rv. II: Patella - 1 rv; tibia - about 30 pv to rv; metatarsus - about 30 pv to rv; tarsus - 14 pl to pv, 2 v, 22 rl to rv. III, IV: Many pl to rl spines on tibiae to tarsi, no rl spines on metatarsus IV; 3-4 dorsal spines on metatarsus III.

Trichobothria: I: Tibia - 4 pd, 3 rd in proximal half; metatarsus - 2 rd followed by 4 d (last rd and first d on same level) in distal half; tarsus - 13/14 d to rd, irregularly arranged. II: Tibia - 3/4 pd, 4 rd in proximal half; metatarsus - 3/4 rd followed by 3/4 d (last rd and first d on same level) in distal half; tarsus - 15 d to rd, irregularly arranged. III: Tibia - 4 pd, 4 rd in proximal half; metatarsus - 3/4 rd followed by 2 d (none on same level) in distal half; tarsus - 16/17 d to rd, irregularly arranged. IV: Tibia - 5/6 pd, 5 rd in proximal half; metatarsus - 3 rd followed by 1/2 d (none on same level) in distal half; tarsus - 11/12 d to rd, irregularly arranged.

Paired tarsal claws with 1-2 proximal teeth on leg I, 2 teeth on other legs, 1 large principal tooth with 1 tiny (on legs I-III) or 1 small (on leg IV) secondary tooth. Unpaired claws bare.

Opisthosoma 13.1 long, 9.4 wide; disc 7.9 in diameter, distinctly less sclerotized than in ♀♀, ribs narrower and with peglike tubercles reduced to indistinct dark dots (Fig. 53). Rib angles indistinctly elevated, carrying only about 13 short blunt bristles each. Ribs outside opisthosomal disc well-developed, distinctly sclerotized for about one third of opisthosomal length posterodorsally (less so posterolaterally and posteroventrally) (Figs 54, 55). Rudimentary tergite (?) more distinct than in ♀♀.

Crescent-shaped sclerite between spinnerets (plus anus) and ventral rim of opisthosomal disc broadly connected to median ventral rib angle (Fig. 35).

Posterior median spinnerets 1.1 long; posterior lateral spinnerets 2.7 long (proximal segment 1.2, median 0.9, distal 0.6).

PALP AND LEG MEASUREMENTS OF ♀ AND ♂ (IN PARENTHESES) DESCRIBED ABOVE

	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
Palp	4.7 (5.3)	3.6 (3.0)	3.4 (3.7)	- -	4.0 (2.0)	15.7 (14.0)
Leg I	6.5 (7.0)	4.1 (3.4)	3.8 (4.8)	3.5 (4.7)	2.0 (2.0)	19.9 (21.9)
Leg II	5.3 (6.1)	3.8 (3.2)	2.7 (3.9)	2.9 (4.3)	1.8 (1.8)	16.5 (19.3)
Leg III	5.0 (5.4)	3.8 (3.0)	2.5 (3.4)	2.9 (4.3)	1.8 (2.1)	16.0 (18.2)
Leg IV	5.6 (6.3)	4.6 (3.6)	3.3 (4.5)	4.2 (5.9)	2.3 (2.5)	20.0 (22.8)

DESCRIPTION OF JUVENILES

Spiderlings (3rd instar?; body length 3.9, carapace length 1.4, width 1.3), collected from the burrow of their mother, posses fully developed opisthosomal discs with 19-22 ribs and only a single seta per rib angle.

VARIATION

Measurements and rib counts: ♀♀ (n=5), ♂♂ (n=4) in parentheses. Body length < 36.9 (21.3-24.3), carapace length < 12.7 (7.5-8.7), width < 11.2 (6.6-7.7); rib counts 20-23 (23-26).

Bristles behind AME in T-shaped (anterior 3 bristles on the same transversal level; 2 ♂, 3 ♀) or in Y-shaped arrangement (anterolateral bristles in front of anteromedian one; 2 ♂, 2 ♀); in one ♀ the left lateral seta in this arrangement is missing.

In larger (and older) ♀♀ the sclerites are darker and the opisthosomal ribs outside the disc more strongly sclerotized than in smaller specimens.

One ♂ possesses 2 rv distal spines on its left patella I (Fig. 36); some ♂♂ have 1-2 of the v distal bristles on patella I developed as spines. One large ♀ has 1 rv distal spine on both patellae of leg I.

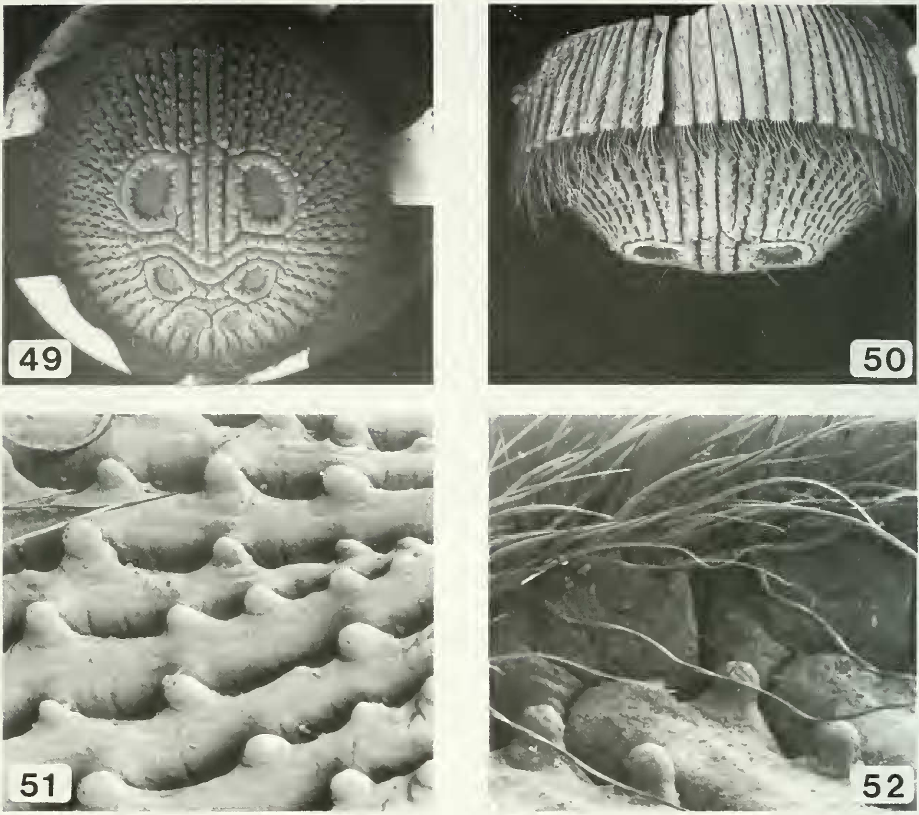
Variation in ♂ and ♀ genitalia, see Figs 41-44 and Figs 45-48, respectively.

RELATIONSHIPS

Geographic proximity suggests that *C. lannaensis* sp. n. is the sister taxon of *C. siamensis* sp. n. and *C. ricketti*, but a possible close relationship with *C. loricata* should also be taken into consideration (see discussion).

BIOLOGY

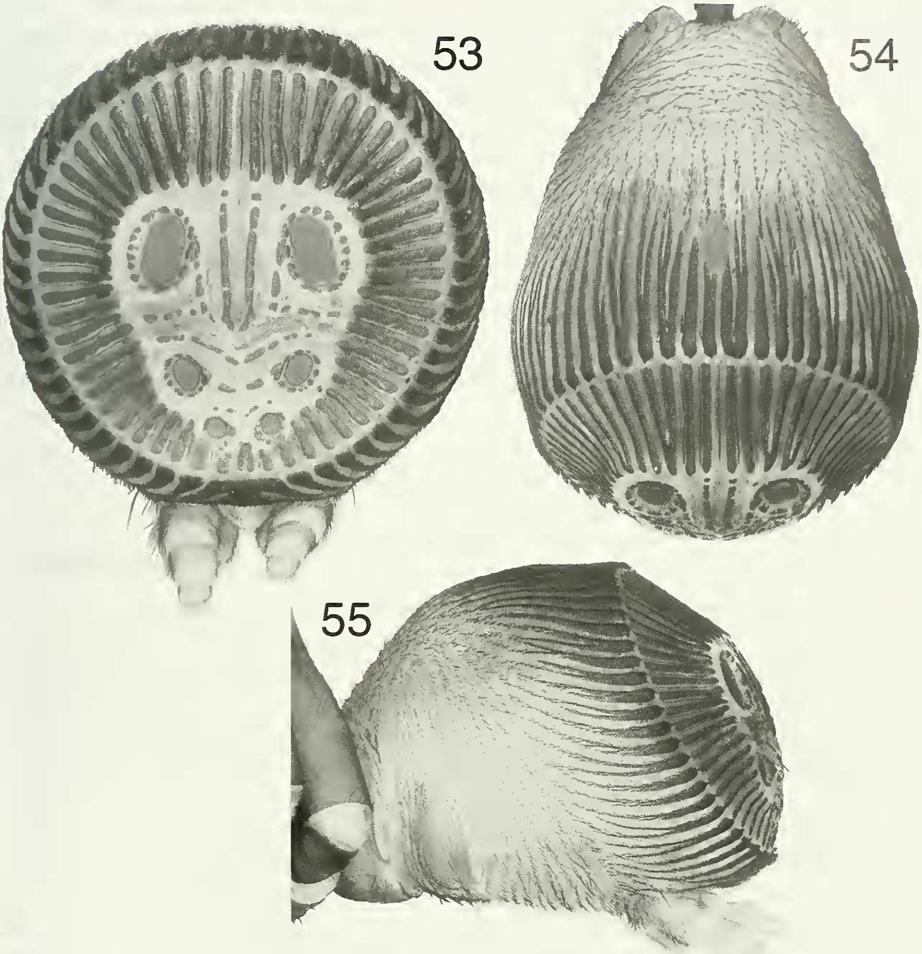
Habitat and burrow. The spiders were all collected from shady (north facing) vertical road cuts in a remnant patch of evergreen hill forest. No preference for a



FIGS 49-52
Cyclocosmia lannaensis sp. n., ♀ (SEM micrographs). 49. Opisthosomal disc, caudal view. 50. Same, dorsal view. 51. Detail of ribs showing tubercles. 52. Detail of ribs and rib angles showing setae and tubercles.

certain zone on these road cuts by specimens of different sizes and age (as seen in *C. siamensis* sp. n.) was observed.

Borrows (up to 19 cm long in the case of females, 10.5 cm in the case of males) were closed with trapdoors (up to 2.6 cm long and 3.6 cm wide in the case of females, 2.0 cm and 2.5 cm in the case of males) and, as in *C. siamensis* sp. n., had dead leaves attached to their entrances and often also to the trapdoors (Pl. 1A). The inside of the burrows was lined with a strong layer of tough silk and constricted to about half its diameter in the lower portion (after about two thirds of the length) where the opisthosomal plug is placed (Pl. 1B). Each burrow ended in a slightly widened terminal part, which was only a little longer than the spider itself. Two large females (one with juveniles) had a second constriction in the upper portion of their burrows (also observed in *C. siamensis* sp. n.), which left a wide median chamber where the spider could turn round. No prey remnants or exuviae were found inside these burrows in the field, but in captivity some spiders deposited heavily fragmented exuviae at the bottom of their burrows.



FIGS 53-55
Cyclocosmia lannaensis sp. n., ♂. 53. Opisthosoma, caudal view. 54. Same, dorsal view. 55. Same, lateral view.

Phenology. In captivity males became mature between late October and mid-March. The maturation date in late October, less than two weeks after the male was captured, presumably accords with the mating period in nature. Another male was raised from an early juvenile instar (3rd instar?; collected from the maternal burrow) and reached maturity after five years in late January (not very long after maturations in the field). Mature males did not feed in captivity. One male courted with jerking movements in front of the burrow of a female, but was turned away by her (perhaps due to disturbance during observation) and no mating occurred. A mature female moulted (and died in the process) in mid-July.

In mid-October a large female was found with 345 juveniles (at least 3rd instar) sheltering below her opisthosomal disc plug at the bottom of the burrow. As in *C. siamensis* sp. n., this indicates that egg development and brooding extend over a full year and that females do not reproduce annually. Considering that it takes fives years (at least for males) to become mature and that females reproduce only each second year, it is likely that these spiders live for ten years and more. *Cyclocosmia* specimens from America have survived more than twelve years in captivity (Gertsch & Platnick, 1975: 2).

DISTRIBUTION

Cyclocosmia lannaensis sp. n. is known only from a mountain at the northernmost tip of Thailand, a few kilometres away from the border to Myanmar (= Burma). This species is probably more widely distributed in mountainous regions of Myanmar and possibly also of Laos.

DISCUSSION

Relationships. According to the character polarization given by Gertsch & Platnick (1975: 3-4), *C. ricketti* and *C. siamensis* sp. n. appear to be the most primitive species in the genus *Cyclocosmia*. The large numbers of bristles on rib angles and the wide eye group of both species are considered as plesiomorphic. The same apparently also holds true for the presence of elevated rib angles [not present in *C. truncata* (Hentz)], for the absence of a dorsally emarginated tibia III [present in *C. loricata* (C. L. Koch)] and for parallel-sided spermathecae (medially constricted or apically widened spermathecae present in all other congeners). Accordingly *C. lannaensis* sp. n. is more derived than the other two Asian species, mostly due to its medially constricted spermathecae with knob-shaped apices, which are quite similar to those of *G. loricata* from Mexico and Guatemala (Figs 45-48, cf. Gertsch & Platnick, 1975: fig. 27). Additional congruences between these two species are found in the Y-shaped arrangement of long bristles behind the AME and in similar low rib counts (Figs 32, cf. Gertsch & Platnick, 1975: 15-18, figs 31, 35). The reduction in numbers of ribs on the opisthosomal disc of *C. lannaensis* sp. n. follows the same trend as seen in American *Cyclocosmia* spp., whereas the numbers of bristles on its rib angles appear to have increased. Therefore *C. lannaensis* sp. n. is either the sister taxon of *C. siamensis* sp. n. plus *C. ricketti*, or that of *C. loricata*. A taxonomic revision of all *Cyclocosmia* species is necessary properly to analyse phylogenetic relationships within this genus.

Zoogeography. Like most other trapdoor spiders, *Cyclocosmia* species are of a sedentary disposition and possess very poor powers of dispersal. There is no indication that their spiderlings disperse by gossamer. Therefore it is very unlikely that the disjunct trans-Pacific distribution of *Cyclocosmia* results from migration through the high latitude Bering Bridge (Beringia) in the Tertiary, as is the classical explanation for such a distribution. Apart from the short time frame, suitable habitats or a direct land connection may not have existed there in the Tertiary (Shields, 1979: 183, 184).

Vicariance due to the opening of the Pacific Ocean and the subsequent separation of East and Southeast Asia from North America in the Jurassic would better explain the distribution of *Cyclocosmia*. This scenario is part of the "Rapid Earth Expansion" hypothesis, which postulates that in the Jurassic the earth was much smaller than today, and which is based on geological data, fossil data and numerous examples of trans-Pacific disjunctions in extant plants and animals (McCarthy, 2003; Shields, 1979, 1988). *Cyclocosmia lannaensis* sp. n. (northern Thailand) and *C. loricata* (Mexico, Guatemala) may represent another example of trans-Pacific sister taxa that occur at about the same latitude, a phenomenon interpreted as evidence for this hypothesis. Additional examples of trans-Pacific disjunctions in the northern hemisphere, which refer to ground-dwelling or burrowing spiders with requirements for humid conditions and which probably also result from vicariance, are: *Antrodiaetus* (Antrodiaetidae) (Japan - USA; Coyle, 1971), Pachylomerinae (Ctenizidae) (South and Southeast Asia, Australia, western Pacific islands - North and Central America; Raven, 1985), Hypochilidae (China - USA; Forster *et al.*, 1987) and the *Callilepis schuszteri* group (Gnaphosidae) (France to Japan - southwestern N-America; Platnick, 1976). Although the "Rapid Earth Expansion" hypothesis appears somewhat radical, the body of evidence represented by such disjunctions requires its further consideration.

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